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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/243,689	02/03/1999	RICHARD M. WASSERMAN	101473	2795

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OLIFF & BERRIDGE, PLC
P.O. BOX 19928
ALEXANDRIA, VA 22320

EXAMINER	
GARCIA OTERO, EDUARDO	
ART UNIT	PAPER NUMBER
2123	28

DATE MAILED: 03/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	09/243,689	WASSERMAN, RICHARD M.
	Examiner	Art Unit
	Eduardo Garcia-Otero	2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 30 January 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 45-72 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 45-72 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION: Non-Final Action

Introduction

1. Title is: HARDWARE SIMULATION SYSTEMS AND METHODS FOR VISION INSPECTION SYSTEMS
2. First named Inventor is: WASSERMAN.
3. Claims 45-72 of US Application 09/243,689 filed on 2/3/99, are presented for examination.
4. This Action is in response to the personal interview of 2/20/04.
5. Prior 35 USC 102 rejections are replaced by 35 USC 103 rejections, and this action is made non-final.
6. The finality of the prior action is withdrawn.

Index and Definitions

7. **Stevenson** refers to "Modeling optical vision systems with innovative software" by Michael Stevenson et al., Vision Systems Design, January 1999, pages 29-35 (from IDS).
8. **Thomas** refers to US Patent 5,137,450 (from PTO form 892).
9. **Robotics** refers to "Robotics" (Understanding Computers series) by Time-Life Books, 1986, ISBN 0-8094-5969-6 (from PTO form 892). Note that some additional pages (19-25) are presented with this action.

35 USC § 112-Second Paragraph-indefinite claims: "off-line"

10. The following is a quotation of the second paragraph of 35 U.S.C. 112: The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
11. **Claim 45-72 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite** for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
12. Applicant has repeatedly asserted that the term **"off-line programming system"** in the preamble and in the body of claim 45 should be given patentable weight beyond the explicit limitations in the claim. The Examiner hereby gives the term <u>some</u> weight.
13. Note that the term "off-line" appears to be a complex combination of negative and positive limitations, said limitations deriving their meaning from the context of the term. For example: off-line power generator, off-line computer, and off-line welder (removed from an

assembly line), or shutting down an assembly line (going off-line). Said examples have totally different meanings associated with the term "off-line". In other words, the term "off" has many possible meanings, and the term "line" has many possible meanings. Further, negative limitations must be clearly defined and explicitly stated in the claim. Any positive limitation must be similarly defined and stated in the claim.

14. For example, an "off-line emergency generator" at a hospital may have the negative limitation of not providing power when external power is available, and the positive limitation of automatically providing power to critical systems (like heart pumps) when no external power is available.
15. Additionally, please state which portion of the original disclosure provides support for said positive and/or negative limitations. If said limitations are not supported by the original disclosure, then said amendments will be objected to as new matter.
16. For the purposes of the 35 103 art rejection below, claim limitations E1-E3 are interpreted as being "off-line", and the Stevenson prior art is also interpreted as being off-line.
17. Additionally, the claim 45 term **"control instruction"** is indefinite. It is not clear how the results of the simulation are used to generate a control instruction. And it is not clear what type of "instructions" are intended. For example, perhaps a keypad is the "control instruction generating portion" of claim 45, and the "control instructions" are generated by typing them into the keypad. Further, it is not clear how limitation D "control instruction generating portion" is patentably distinct from limitation E3 "[operable to] generate at least one control instruction". Please support any asserted distinction with citations from the original disclosure.
18. Claims 46-72 are rejected for the same reasons as claim 45.

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
20. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows: Determining the scope and contents of the prior art.

Ascertaining the differences between the prior art and the claims at issue. Resolving the level of ordinary skill in the pertinent art. Considering objective evidence present in the application indicating obviousness or nonobviousness.

21. **Claims 45-72 are rejected under 35 U.S.C. 103(a) as being unpatentable.**
22. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stevenson in view of Robotics.
23. Claim 45 is an independent "system" claim, with 5 limitations labeled A-E by the Examiner for clarity. Note that A has three subparts, B has 2 subparts, and E has 3 subparts. Said subparts are numerically labeled by the Examiner for clarity.
24. A1-**user interface... display a synthetic image** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated and analyzed using software technology... simulate and analyze almost any optical vision system with high geometric and photometric accuracy". Note the car models displayed (synthetic images) at page 29 and page 30. Further note that these displays show tool bars and legends which are part of the user interface.
25. A2-[user interface...] **at least one control element that affects the focus** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
26. A3-[user interface...] **input portion for receiving CAD data** is disclosed by Stevenson at page 30 "This allows objects characterized in the Rhinoceros 3-D modeling program to be imported into ASAP for further analysis."
27. B1-**hardware component simulation system... first portion... including a limited depth of field of the sense system** is disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
28. B2-[hardware component simulation system]... **second portion... relative position** is disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this

situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

29. C-**communication interface... between the user interface and the hardware component simulation system** is inherently disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that the displays at pages 29 and 30 inherently have a communication interface between the display monitor and the simulation system. Similarly, the keyboard and/or mouse which is used to interact with the toolbars inherently has a communication interface between the display monitor and the simulation system.
30. E1-is operable to... focus dependent synthetic image... based on **at least 2 of a current state of the user-alterable control elements [focus], the current lens system representation of the first portion [depth of field], and the current state representation of the second portion [relative position]** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
31. E2-**display the current focus-dependent synthetic image** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated and analyzed using software technology... simulate and analyze almost any optical vision system with high geometric and photometric accuracy". Note the car models displayed (synthetic images) at page 29 and page 30.
32. E3-**generate at least one control instruction** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that to "decide" the "proper" parameters inherently means controlling them with instructions.

33. The additional limitations are not expressly disclosed by Stevenson.
34. D-**control instruction generating portion** is disclosed by Robotics figures and text on page 54 and 55, especially the top right figure on page 55 which states "using a remote control device called a teach pendant, a trainer maneuvers a robot to one of many desired positions". Note that Robotics was supplied to the Applicant with the prior office action. Also see Robotics pages 19-25 which discuss robotic vision: particularly pages 22-23 which show robotic vision (or machine vision) for quality control of parts on an assembly line.
35. Additionally, note that this "control instruction generating portion" limitation is implicitly disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that to "decide" the "proper" parameters implicitly means controlling them with instructions. If the machine vision being modeled by Stevenson is controlled by computers (which is implicit in a modern automobile manufacturing facility using robots), then said control would consist of writing new control instructions to computer control the proper parameters as listed in great detail by Stevenson.
36. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Robotics to modify Stevenson. One of ordinary skill in the art would have been motivated to do this to implement Stevenson's machine vision simulation analysis of optimized parameters ("decide the proper light source intensity...") in a modern computer controlled factory using robots, as displayed in Robotics pages 21-25 and 54-55. Although not quite inherent, it is implicit that Stevenson's complex focus dependent machine vision simulation results will be implemented in a physical machine vision system that is controlled with computers.
37. <u>Claims 46-72 are rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Stevenson in view of Robotics and Thomas.
38. In claim 46, **"includes at least one control instruction... determines that a focus dependent actual inspection image..."** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging

camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that Webster defines "depth of focus" as "the range of distances of the image behind a camera lens or other image-forming device measured along the axis of the device throughout which the image has acceptable sharpness". Thus, any part of an object positioned in the "depth of focus" will have "acceptable sharpness". Additionally, note page 34 states "every optical-vision system has unique values determining its formal range of best focus".

39. In claim 47, **"control element that affects the focus of the synthetic image appears and operates substantially similarly to a control element included in a user interface of the machine vision inspection system"** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. Note Column 5 line 39 states "simulated heads-up display to complete the simulation for a typical tactical fighter". Thus, it is well known in the art to simulate the user interface as closely as possible for training purposes, even down to the pilot's chair.

40. In claim 48, **"the at least one control element that affects the focus of the synthetic image comprises at least one of a) a focusing control element... b) a motion control element"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that "light-source... position" implies that the light-source may be moved. Note that "imaging cameral position" implies that the camera position may be moved. Further, note that it is inherent that adjusting focus requires physically moving the physical lenses.

41. In claim 49, **"plurality of lenses",** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that if the physical system contained a plurality of lenses, then the analysis would inherently model the plurality of lenses. Further note that the use of lenses in

series is well known in the art (telescopes), and the use of swapping lenses in a system is also well known in the art (microscopes).

42. In claim 50, "displays **a modified current focus dependent synthetic image in response to a modification of at least one of a) the current state of the user-alterable control elements...**" is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that Claim 45 limitation A2 defines "user-alterable control elements" as "comprising at least one control element that affects the focus".
43. Claim 51 contains three additional limitations:
44. A-**graphical user interface including user-alterable control elements and an image display portion** is disclosed by Stevenson at the figure on page 29. Note the toolbars that form part of the graphical user interface.
45. B-**the user interface of the off-line programming system is substantially similar to the user interface of the machine vision inspection system** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. Note Column 5 line 39 states "simulated heads-up display to complete the simulation for a typical tactical fighter". Thus, it is well known in the art to simulate the user interface as closely as possible for training purposes, even down to the pilot's chair. If the actual system being replicated contained a graphical user interface, then the simulation trainer would also have a similar graphical user interface. Additionally, note that Specification page 1 line 21 states "Off-line programming software tools are popular". The phrase "off-line" implies that the actual user interface is used, while only the measuring machines and robots are simulated.
46. C-**majority of the user-alterable control elements typically appear and operate substantially similarly in both the off-line programming system and the machine vision inspection system** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. Additionally, note that Specification page 1 line 21 states "Off-line

programming software tools are popular". The phrase "off-line" implies that the actual user interface is used, while only the measuring machines and robots are simulated.

47. Claim 52 contains three additional limitations:
48. A-**a third portion operable to represent a current state of a lighting system of the machine vision inspection system** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
49. B-**the user alterable control elements comprise at least one control element that affects the apparent lighting in the synthetic image representative of an image acquired by the machine vision system** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that Stevenson's "decide the proper light-source intensity" inherently implies a control element that affects the apparently lighting.
50. C-**the off-line programming system is operable to generate the current focus-dependent synthetic image based on at least three of [1] a current state of the user alterable control elements, [2] the current lens system representative of the first portion [represent at least a current lens system... including a limited depth of field of the lens system], [3] the current state representation of the second portion [represent a current state of at least the relative position] and [4] the current representation of the third portion [represent a current lighting system]** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note Stevenson discloses all four of the sub-limitations (1 through 4). Further note that Stevenson's term "decide" means that Stevenson's listed factors are

alterable, and that a current representation is generated based upon the current state of each factor.

51. In claim 53, **"the at least one control element that affects the apparent lighting in the synthetic image comprises a user-alterable control element of the machine vision inspection system, such that the at least one control element that affects the apparent lighting in the synthetic image appears and operates substantially similarly in both the off-line programming system and the machine vision inspection system** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that some of Stevenson's parameters apper to be user-alterable, such as light-source position, and imaging camera position. Also see Stevenson page 30 "These features enable designers to visualize all the key elements of their system's optical performance".
52. In claim 54, there are four additional limitations.
53. A-**input operation instructions which are substantially similar to the... machine vision inspection system** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is duplicated, and the input operation instructions are implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17.
54. B-**hardware component simulation system processes the input operation instructions in order to generate the current focus-dependent synthetic image** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
55. C-**the user-alterable control elements include elements operable to input image inspection operation instructions substantially similar to at least one control instruction usable in the inspection program** is disclosed by Thomas at FIG 3. Note that the Thomas

flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is duplicated, and the input operation instructions are implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17.

56. D-**hardware component simulation system generates the current focus-dependent synthetic image... substantially similar to... the machine vision inspection system** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is duplicated, and the input operation instructions are implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17.
57. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Thomas to modify Stevenson. One of ordinary skill in the art would have been motivated to do this to improve the training efficiency of the simulation by simulating the entire system as closely possible. Additionally, simply copying the user interface software modules into the simulation system would save developmental time.
58. In claim 55, there are with 6 limitations labeled A-F by the Examiner. Limitation A has 2 subparts, C has 2 subparts, and F has 3 subparts.
59. A1-**user interface... display a synthetic image** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated and analyzed using software technology... simulate and analyze almost any optical vision system with high geometric and photometric accuracy". Note the car models displayed (synthetic images) at page 29 and page 30. Further note that these displays show tool bars and legends which are part of the user interface.
60. A2-[user interface...] **at least one control element that affects the focus** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

61. A3-[user interface...] **at least one control element... image inspection operation** is disclosed by Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".
62. B-**input portion for receiving CAD data** is disclosed by Stevenson at page 30 "This allows objects characterized in the Rhinoceros 3-D modeling program to be imported into ASAP for further analysis."
63. C1-**hardware component simulation system... first portion... including a limited depth of field of the lense system** is disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
64. C2-[hardware component simulation system]... **second portion... relative position** is disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
65. D-**communication interface... between the user interface and the hardware component simulation system** is inherently disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that the displays at pages 29 and 30 inherently have a communication interface between the display monitor and the simulation system. Similarly, the keyboard and/or mouse which is used to interact with the toolbars inherently has a communication interface between the display monitor and the simulation system.
66. E-**control instruction generating portion** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that to "decide" the "proper" parameters inherently means controlling them with instructions.

67. F1-is operable to… focus dependent synthetic image… based on **at least 2 of a current state of the user-alterable control elements [focus], the current lens system representation of the first portion [depth of field], and the current state representation of the second portion [relative position]** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
68. F2-**display the current focus-dependent synthetic image** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated and analyzed using software technology… simulate and analyze almost any optical vision system with high geometric and photometric accuracy". Note the car models displayed (synthetic images) at page 29 and page 30.
69. F3-**perform an image inspection operation based on the current focus-dependent synthetic image** is disclosed by Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".
70. In claim 56, **"generate at least one control instruction usable in an inspection program"** is disclosed by Robotics figures and text on page 54 and 55, especially the top right figure on page 55 which states "using a remote control device called a teach pendant, a trainer maneuvers a robot to one of many desired positions". Note that Robotics was supplied to the Applicant with the prior office action. Also see Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots", which implicitly would be implemented on the actual physical system using computer controls, if the machine vision system was in a modern manufacturing facility.
71. In claim 57, there are 5 limitations labeled A-E by the Examiner. Limitation A has 4 subparts, C has 2 subparts, and E has 3 subparts.
72. A1-"**user interface substantially similar to the graphical user interface of the machine vision inspection system… display a synthetic image"** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is

duplicated, and any graphical user interface is implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17. One of ordinary skill in the art would understand that realistic simulation requires duplicating all interfaces as exactly as possible, including graphical user interfaces. Note that graphical user interfaces are well known in the art, and are defined by Computer User Dictionary (1998) as "A type of environment that represents programs, files, and options by means of icons, menus, and dialog boxes on the screen. The user can select and activate these options by pointing and clicking with a mouse or, often, by using the keyboard...".

73. A2-[user interface...] **at least one control element that affects the focus** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
74. A3-[user interface...] **at least one control element... image inspection operation** is disclosed by Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".
75. A4-**majority of the user-alterable control elements typically appear and operates substantially similarly in both the machine vision inspection simulation system and the machine vision...** is disclosed by Thomas at FIG 3. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is duplicated, and any graphical user interface is implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17. One of ordinary skill in the art would understand that realistic simulation requires duplicating all interfaces as exactly as possible, including the control elements.
76. B-**input portion for receiving CAD data** is disclosed by Stevenson at page 30 "This allows objects characterized in the Rhinoceros 3-D modeling program to be imported into ASAP for further analysis."
77. C1-**hardware component simulation system... first portion... including a limited depth of field of the lens system** is disclosed by Stevenson at page 32 "functional limitations

inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

78. C2-[hardware component simulation system]... **second portion... relative position** is disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
79. D-**communication interface... between the user interface and the hardware component simulation system** is inherently disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that the displays at pages 29 and 30 inherently have a communication interface between the display monitor and the simulation system. Similarly, the keyboard and/or mouse which is used to interact with the toolbars inherently has a communication interface between the display monitor and the simulation system.
80. E1-is operable to... focus dependent synthetic image... based on **at least 2 of a current state of the user-alterable control elements [focus], the current lens system representation of the first portion [depth of field], and the current state representation of the second portion [relative position]** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
81. E2-**display the current focus-dependent synthetic image** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated and analyzed using software technology... simulate and analyze almost any optical vision system with high geometric and photometric accuracy". Note the car models displayed (synthetic images) at page 29 and page 30.

82. E3-**perform an image inspection operation based on the current focus-dependent synthetic image** is disclosed by Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".
83. In claim 58, **"plurality of lenses"** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated". The mathematics of multiple lenses in series is well known in the art, and common in telescopes and cameras. Additionally, swapping multiple lenses is well known in devices such as microscopes.
84. In claim 59, **"at least one of a) the current state of the user-alterable control elements [focus], b) the current lens system representation of the first portion [depth of field], and c) the current state representation of the second portion [relative position]"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
85. Claim 60 has three additional limitations:
86. A-**"current state of a lighting system"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
87. B-**"at least one control element that affects the apparent"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".
88. C-**"based on at least three of a) the current state of the user-alterable control elements [focus], b) the current lens system representation of the first portion [depth of field], and c) the current state representation of the second portion [relative position] and the current state representation of the third portion [image inspection]"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional

limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots". Note that the Examiner is interpreting "third portion" as meaning "image inspection" in view of parent claim 57.

89. In claim 61, **"a plurality of lights of the machine vision inspection system"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Although Stevenson does not explicitly disclose a plurality of lights, the Examiner takes Official Notice that multiple lights are often used in photography, and are necessary to clearly illuminate complex three dimensional objects. One of ordinary skill in the art of optical vision systems would be familiar with the use of multiple lights. Also note MPEP 2144.04(VI)(B). *In re Harza,* 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced".

90. The Applicant is entitled to traverse the official notice according to MPEP § 2144.03. However, MPEP § 2144.03 further states "See also In re Boon, 439 F.2d 724, 169 USPQ 231 (CCPA 1971) (a challenge to the taking of judicial notice must contain adequate information or argument to create on its face a reasonable doubt regarding the circumstances justifying the judicial notice)." Specifically, In re Boon, 169 USPQ 231, 234 states "as we held in Ahlert, an applicant must be given the opportunity to challenge either the correctness of the fact asserted or the notoriety or repute of the reference cited in support of the assertion. We did not mean to imply by this statement that a bald challenge, with nothing more, would be all that was needed". Further note that 37 CFR § 1.671(c)(3) states "Judicial notice means official notice". Thus, a traversal by the Applicant that is merely "a bald challenge, with nothing more" will be given very little weight.

91. In claim 62, 3 additional limitations:

92. A-**user-alterable control elements [focus]... substantially similar to... the machine vision inspection system** is disclosed by Stevenson at page 32 "This type of analysis also

permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

93. B-**generate the current focus-dependent synthetic image** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution", and the displayed images at page 29 and page 30.

94. C-**generates the current focus-dependent synthetic image in a form which is operable with the at least one control element which is operable to perform an image inspection operation based on the current focus-dependent synthetic image to provide an off-line environment for training a part program based on a focus-dependent synthetic image that is substantially similar to an environment that is provided by the machine vision inspection system for training a part program based on a focus-dependent actual image** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution", and Stevenson page 30 "These features enable designers to visualize all the key elements of their system's optical performance", and Stevenson page 29 "fine-tune".

95. In claim 63, "**further comprising a control instruction generating portion, wherein the machine vision inspection simulation system is further operable to generate at least one control instruction usable in an inspection program for the at least one object inspectable by the machine vision inspection system, based at least partially on the current state of the user-alterable control elements**" is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that Stevenson's term "decide the proper… " means that the

simulated system is used to determine the "proper" settings or control instructions for the actual system.

96. In claim 64, **"external view representing the overall configuration of the machine vision inspection system"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

97. In claim 65, 4 limitations A-D. Limitation A has 2 subparts, B has 2 subparts, and D has 4 subparts:

98. A1-**user interface... display a synthetic image representative of an image acquired by the machine vision system** is disclosed by Thomas at FIG 3, and at Column 5 line 39 "simulated heads-up display". Note that the simulated heads-up display includes machine vision images such as radar acquired artificial horizon and enemy fighters. Note that the Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is duplicated, and any graphical user interface is implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17. One of ordinary skill in the art would understand that realistic simulation requires duplicating all interfaces as exactly as possible, including graphical user interfaces. Note that graphical user interfaces are well known in the art, and are defined by Computer User Dictionary (1998) as "A type of environment that represents programs, files, and options by means of icons, menus, and dialog boxes on the screen. The user can select and activate these options by pointing and clicking with a mouse or, often, by using the keyboard...".

99. A2-[user interface...] **at least one control element that affects the focus** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

100. B1-**hardware component simulation system... first portion... including a limited depth of field of the lens system** is disclosed by Stevenson at page 32 "functional

limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

101. B2-**hardware component simulation system... first portion... including a limited depth of field of the lens system** is disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

102. C-**communication interface... between the user interface and the hardware component simulation system** is inherently disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that the displays at pages 29 and 30 inherently have a communication interface between the display monitor and the simulation system. Similarly, the keyboard and/or mouse which is used to interact with the toolbars inherently has a communication interface between the display monitor and the simulation system.

103. D1-**inputting CAD data** is disclosed by Stevenson at page 30 "This allows objects characterized in the Rhinoceros 3-D modeling program to be imported into ASAP for further analysis."

104. D2- **focus dependent synthetic image... based on at least 2 of a current state of the user-alterable control elements [focus], the current lens system representation of the first portion [depth of field], and the current state representation of the second portion [relative position]** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

105. D3-**displaying** is disclosed by Stevenson at page 29 figure and page 30 figures.

106. D4-**generating at least one control instruction... based at least partially on the current state of the user-alterable control elements [focus]** is disclosed by Stevenson at

page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

107. In claim 66, **"altering the at least one control element that affects the focus of the synthetic image"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

108. In claim 67, **"displaying a modified current focus-dependent synthetic image... at least one of a) the current state of the user-alterable control elements [focus], b) the current lens system representation of the first portion [depth of field], and c) the current state representation of the second portion [relative position]"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

109. In claim 68, **"at least one control element... image inspection operation"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

110. In claim 69, 7 limitations A-G. Limitation A has 4 subparts, B has 2 subparts:

111. A1-**user interface... display a synthetic image representative of an image acquired by the machine vision system** is disclosed by Thomas at FIG 3, and at Column 5 line 39 "simulated heads-up display". Note that the simulated heads-up display includes machine vision images such as radar acquired artificial horizon and enemy fighters. Note that the

Thomas flight simulator substantially duplicates the user interface of the actual airplane, including the control panel and control elements. The physical user interface is duplicated, and any graphical user interface is implicitly duplicated as well. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17. One of ordinary skill in the art would understand that realistic simulation requires duplicating all interfaces as exactly as possible, including graphical user interfaces. Note that graphical user interfaces are well known in the art, and are defined by Computer User Dictionary (1998) as "A type of environment that represents programs, files, and options by means of icons, menus, and dialog boxes on the screen. The user can select and activate these options by pointing and clicking with a mouse or, often, by using the keyboard...".

112. A2-[user interface...] **at least one control element that affects the focus** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

113. A3-[user interface...] **at least one control element... image inspection** is disclosed by Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

114. A4-**majority of the user-alterable control elements [focus] and image processing tools typically appear and operate substantially similarly** is disclosed by Thomas at FIG 3. Note that Thomas' goal is "realistic flight simulation" at Column 1 line 17. One of ordinary skill in the art would understand that realistic simulation requires duplicating all interfaces as exactly as possible, including control elements and image processing tools.

115. B1-**hardware component simulation system... first portion... depth of field** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

116. B2-**second portion... relative position and the [third] portion... inspection** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the

functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

117. C-**communication interface... between the user interface and the hardware component simulation system** is inherently disclosed by Stevenson at page 32 "functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution". Note that the displays at pages 29 and 30 inherently have a communication interface between the display monitor and the simulation system. Similarly, the keyboard and/or mouse which is used to interact with the toolbars inherently has a communication interface between the display monitor and the simulation system.

118. D-**inputting CAD data** is disclosed by Stevenson at page 30 "This allows objects characterized in the Rhinoceros 3-D modeling program to be imported into ASAP for further analysis."

119. E-**focus-dependent synthetic image... based on at least 2 of a current state of the user-alterable control elements [focus], the current lens system representation of the first portion [depth of field], and the current state representation of the second portion [relative position]** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

120. F-**displaying the current focus-dependent synthetic image** is disclosed by Stevenson at page 29 "Quality-control optical vision systems can be conveniently simulated and analyzed using software technology... simulate and analyze almost any optical vision system with high geometric and photometric accuracy". Note the car models displayed (synthetic images) at page 29 and page 30.

121. G-**operating at least one control element which is operable to perform an image inspection operation** is disclosed by Stevenson at page 32 "This type of analysis also

permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

122. Stevenson does not expressly disclose the remaining limitations (A1 and A4).

123. In claim 70, **"displaying a modified current focus-dependent synthetic image... at least one of a) the current state of the user-alterable control elements [focus], b) the current lens system representation of the first portion [depth of field], and c) the current state representation of the second portion [relative position]"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution" and page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

124. In claim 71, **"focus-dependent synthetic image on the current state representation of the third portion [lighting]"** is disclosed by Stevenson at page 32 "This type of analysis also permits designers to dissect the functional limitations inherent to their system. In this situation it is possible to decide the proper light-source intensity and position, imaging camera position, depth of focus, effective focal length, field of view, and CCD camera resolution".

125. In claim 72, **"inspection"** is disclosed by Stevenson at page 30 "visual geometry inspection" and page 35 "searches the image for hot spots".

126. MOTIVATION FOR CLAIMS 46-72. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Robotics and Thomas to modify Stevenson. Stevenson discloses a highly detailed machine vision simulation (with focus), which is intended to design, and analyze, and optimize actual physical machine vision systems. One of ordinary skill in the art would be motivated to implement the simulation results from Stevenson in a modern manufacturing environment by using Robotics' robots (with associated computers) to physically move the camera and lights around a car (for

example), much in the same way that the Robotics paint gun is moved at the end of a robot arm. Note that many of Stevenson's figures are car related, and that Robotics' paint guns are commonly used to paint new cars. In view of the figures, Stevenson's simulation appears especially intended for analyzing the fresh paint in new cars.

127. Further, one of ordinary skill in the art would be motivated to use Thomas to make the user interface (including graphical user interface, and physical user interface, and related instructions) of the simulation similar to the user interface of the actual physical system being simulated for three reasons: first, it saves time and money to use the user interface software module from the actual physical system rather than to devise and design a new interface for the simulation. Second, it is preferable to use the same interface in simulation in order to more realistically train the human operator. Third, using the same interface in simulation facilitates future training of the actual physical system by the operator (per Robotics page 54 where the operator is training the robot using a "teach pendant"). Thus, the simulation may be used to "train" both the operator and the actual physical system.

Additional Cited Prior Art

128. The following US patents or publications are hereby cited as prior art, but have not been used for rejection. Applicant should review these carefully before responding to this office action. US Patent 4,471,448 by Williams. Note that Willams FIG 7 element 702 ANALYTICAL MODEL discloses a simulation of machine vision system with focus (the Hubble Telescope), and that said simulation results are used to control element 700 PHYSICAL SYSTEM which is the actual Hubble Telescope.

Conclusion

129. All pending claims stand rejected against prior art, and under 35 USC 112.

Communication

130. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Tuesday through Friday from 9:00 AM to 8:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone number for this group is 703-872-9306. Any inquiry of a general nature or relating to the status of this

application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

* * * *

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER